Power rule

Finally, we've gotten to the point where things start to get easier. We've moved past the difference quotient, which was cumbersome and tedious and generally not fun. You're about to learn several new derivative tricks that will make this whole process a whole lot easier, starting with the derivative of a constant.

The derivative of a constant

The derivative of a constant (a term with no variable attached to it) is always 0. Remember that the graph of any constant is a perfectly horizontal line. Remember also that the slope of any horizontal line is 0. Because the derivative of a function is the slope of that function, and the slope of a horizontal line is 0, the derivative of any constant must be 0.

The derivative rules

In the next sections, we'll learn about how to use the most common derivative rules, including

Power rule	$h(x) = ax^n$	$h'(x) = (a \cdot n)x^{n-1}$
Product rule	$h(x) = f(x)g(x)$	$h'(x) = f(x)g'(x) + f'(x)g(x)$
Quotient rule	$h(x) = \dfrac{f(x)}{g(x)}$	$h'(x) = \dfrac{f'(x)g(x) - f(x)g'(x)}{\left[g(x)\right]^2}$

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Reciprocal rule	$h(x) = \frac{a}{f(x)}$	$h'(x) = -a\frac{f'(x)}{\left[f(x)\right]^2}$

The power rule

The power rule is the tool you'll use most frequently when finding derivatives. The rule says that for any term of the form ax^n, the derivative of the term is

$$(a \cdot n)x^{n-1}$$

To use the power rule, multiply the variable's exponent n, by its coefficient a, then subtract 1 from the exponent. If there is no coefficient (the coefficient is 1), then the exponent will become the new coefficient.

Example

Find the derivative of the function.

$$f(x) = 7x^3$$

Applying power rule gives

$$f'(x) = 7(3)x^{3-1}$$

$$f'(x) = 21x^2$$

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